

Claims

What is claimed is:

1. A method of inducing or enhancing production or secretion of at least one secondary metabolite by plant cells, said method comprising:
transforming plant cells with an expression vector comprising an expression cassette comprising a gene encoding an ABC-transporter;
selecting transformed plant cells having an induced or enhanced production or secretion of at least one secondary metabolite; and
propagating such selected transformed plant cells.
2. The method according to claim 1 wherein the secondary metabolites are alkaloids.
3. The method according to claim 1 wherein the ABC-transporters are of plant, fungal, or mammalian origin.
4. The method according to claim 1 wherein the induction or enhancement of the production of at least one secondary metabolite by plant cells results from enhancing the transport of said secondary metabolite into a vacuole.
5. The method according to claim 4 wherein the secondary metabolites are alkaloids.
6. The method according to claim 4 wherein the ABC-transporters are of plant, fungal, or mammalian origin.

7. A method of stimulating the production of secondary metabolites by plants, the method comprising:

transforming said plants with an expression vector comprising an expression cassette comprising a gene encoding an ABC-transporter;

selecting transformed plants based upon enhanced production of secondary metabolites, and

propagating such selected transformed plants.

8. The method according to claim 7 wherein the secondary metabolites are alkaloids.

9. The method according to claim 7 wherein the ABC-transporters are of plant, fungal, or mammalian origin.

10. A transgenic plant cell culture displaying an enhanced production or secretion of an at least one secondary metabolite, wherein said transgenic plant cell is transformed with an expression vector comprising an expression cassette comprising a gene encoding an ABC-transporter.

11. The transgenic plant cell culture of claim 10 further characterized in having
(1) an increased vacuolar localization of said at least one secondary metabolite, or
(2) a secretion or an increased secretion of said at least one secondary metabolite.

12. A transgenic plant material selected from the group consisting of a plant, plant cells, plant seeds and plant progeny, said transgenic plant material capable of an enhanced production or secretion of an at least one secondary metabolite, said transgenic plant material transformed with an expression vector comprising an expression cassette comprising a gene encoding an ABC-transporter.

13. The transgenic plant material of claim 12 further characterized in having an increased vacuolar localization of said at least one secondary metabolite.

14. An isolated polypeptide selected from the group consisting of:

(a) an isolated polypeptide encoded by a polynucleotide comprising the sequence of SEQ ID NO:1;

(b) an isolated polypeptide comprising a polypeptide sequence having at least 83% identity to the polypeptide sequence of SEQ ID NO:2 that induces and/or enhances the production and/or secretion of at least one secondary metabolite in plants or plant cells; and

(c) fragments and variants of the isolated polypeptides of (a) and (b) that induce and/or enhance the production and/or the secretion of at least one secondary metabolite in plants or plant cells.

15. An isolated polynucleotide sequence selected from the group consisting of:

(a) an isolated polynucleotide comprising a polynucleotide sequence of SEQ ID NO:1;

(b) an isolated polynucleotide comprising a polynucleotide sequence having at least 91% identity to SEQ ID NO:1 that, when expressed, induces or enhances the production and/or secretion of at least one secondary metabolite in plants or plant cells;

(c) an isolated polynucleotide encoding the polypeptide sequence of SEQ ID NO:2;

(d) an isolated polynucleotide comprising a polynucleotide sequence having at least 91% identity to polynucleotide encoding the polypeptide sequence of SEQ ID NO:2 that, when expressed, induces or enhances the production and/or secretion of at least one secondary metabolite in plants or plant cells; and

(e) fragments and variants of the isolated polynucleotides of (a) through (d) that, when expressed, induce and/or enhance the production or the secretion of at least one secondary metabolite in plants or plant cells.

16. A process for producing a plant cell exhibiting an enhanced production or secretion of at least one secondary metabolite, said process comprising:

transforming a plant cell with an expression cassette comprising a gene encoding an ABC-transporter; and

selecting transformed plant cells exhibiting enhanced transport of said at least one secondary metabolite into a vacuole.

17. A plant cell produced by the process of claim 16.

18. A transgenic plant including the plant cell of claim 17.